

## **Flue Attachment**

### **Field of the Invention**

5           The present invention relates to a flue connection system. More particularly, the invention relates to a system for attaching a flue duct to an appliance.

### **Background of the Invention**

          Appliances, in general, especially fireplaces are often attached to ducts to facilitate the exchange of gases and air to and from the unit. For example, a common  
10   design of a gas-fired and wood burning fireplace includes a combustion chamber that is vented through a flue duct. An example of this design is described in U.S. Patent No. 5,452,708, the disclosure of which is incorporated herein by reference. Some gas-fired fireplaces also include a duct for drawing intake air into the combustion chamber. The fireplace is connected up to the flue duct or intake air duct during installation.

15           Factory-built fireplace assemblies have long been available as both free-standing and wall recessed units. Traditionally, when a fireplace insert is installed into a home or other structure, the flue ducts are already in place. Therefore, the flue ducts are lined up with the fireplace assembly and attached to the fireplace assembly by, for example, a flue collar that is integrated into the fireplace insert construction.

20           A disadvantage of present fireplace systems is that it can be particularly difficult to align and attach the flue ducts to the fireplace assembly. This is especially true with fireplaces that are manufactured in a slant-back manner. Thus, it can be a very labor-intensive job to simply attach the flue duct to the fireplace during installation.

          Accordingly, it is desirable to provide an appliance system, including fireplace  
25   systems, with an improved way to attach the flue duct to the appliance during installation.

## **Summary of the Invention**

Generally, the present invention relates to an appliance assembly. More particularly, the invention relates to a system for attaching a flue duct to an appliance assembly.

5           In one aspect, a flue connection system for an appliance is provided. A flue connection member defines a first aperture and includes an extending member configured to be coupled to a flue duct. An appliance connection member defines a second aperture, and the appliance connection member is configured to be attached to the appliance. The flue connection member and the appliance connection member are  
10           configured to be coupled to provide fluid communication between the appliance and the flue duct.

          In another aspect the invention relates to an appliance comprising a combustion chamber, a combustible source that produces exhaust gases, a vent system for venting exhaust gases from the combustion chamber to outside of the appliance, and a flue  
15           connection member. The vent system includes a vent opening in the appliance. The flue connection member defines an aperture and includes an extending member. The flue connection member is configured to be coupled to a flue duct and to be coupled to the appliance to substantially align the aperture of the flue connection member with the vent opening of the vent system.

20           In another aspect, a flue connection system for an appliance is provided. The flue connection system comprises a flue connection member. The flue connection member defines an aperture and includes an extending member. The flue connection member is configured to be coupled to a flue duct and to be coupled to the appliance to substantially align the aperture of the flue connection member with a vent opening in  
25           the appliance.

          The above summary of the present invention is not intended to describe each disclosed embodiment or every implementation of the present invention. Figures in the detailed description that follow more particularly exemplify embodiments of the invention. While certain embodiments will be illustrated and describing embodiments  
30           of the invention, the invention is not limited to use in such embodiments.

### **Brief Description of the Drawings**

The invention may be more completely understood in consideration of the following detailed description of various embodiments of the invention in connection with the accompanying drawings, in which:

5           Figure 1 is a schematic side view of an example embodiment of a fireplace in accordance with the present invention;

          Figure 2 is a schematic perspective view of an example embodiment of a flue connection system of the present invention;

          Figure 3 is a schematic side view of the flue plate of Figure 2;

10          Figure 4 is a schematic perspective view of the flue plate of Figure 3 coupled to ducts;

          Figure 5 is a schematic perspective view of an example embodiment of a flue connection system of the present invention;

          Figure 6 is a schematic side view of the flue plate of Figure 5;

15          Figure 7 is a schematic perspective view of the flue connection system of Figure 5;

          Figure 8 is a schematic perspective view of the flue connection system of Figure 5 with the latches engaged;

20          Figure 9 is a schematic perspective view of the flue connection system of Figure 5;

          Figure 10 is a schematic perspective view of the flue connection system of Figure 5 with the latches engaged;

          Figure 11 is a schematic side view of an example embodiment of a fireplace in accordance with the present invention;

25          Figure 12 is a schematic perspective view of an example embodiment of a flue connection system of the present invention;

          Figure 13 is a schematic side view of the flue plate of Figure 12;

          Figure 14 is a schematic plan view of the flue plate of Figure 12;

30          Figure 15 is a schematic perspective view of an example embodiment of a flue connection system of the present invention;

Figure 16 is a schematic side view of the flue plate of Figure 15; and

Figure 17 is a schematic perspective view of the flue plate of Figure 16 coupled to ducts.

5           While the invention is amenable to various modifications and alternate forms, specifics thereof have been shown by way of example and the drawings, and will be described in detail. It should be understood, however, that the intention is not to limit the invention to the particular embodiments described. On the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and  
10       scope of the invention.

### **Detailed Description of the Preferred Embodiments**

The invention is applicable to fireplace assemblies. In particular, the invention relates to a system for attaching a flue duct and/or an intake duct to a fireplace assembly.

15           While the present invention is not so limited, an appreciation of the various aspects of the invention will be gained through a discussion of the examples provided below.

Embodiments of the present invention may be used in conjunction with any system or apparatus that burns any kind of combustible source or fuel (solid, gas, etc.)  
20       and includes flue ducts to vent gases or take in fresh air. A non-exhaustive list of such devices may include fireplaces, grills, furnaces, stoves, appliances, etc. Any application that requires venting for the passage of air, gas, or waste products, or any application that requires the attachment of a device to ducts may benefit from the present invention. While the example embodiments of the present invention provided below are described  
25       in conjunction with an example fireplace, the present invention is equally applicable to other systems or apparatuses as discussed above.

If the present invention is used in conjunction with a fireplace, the fireplace can be any type of gas or wood-burning fireplace. For example, the present invention may be applicable to any prefabricated gas fireplace such as a direct vent, a universal vent, a

B-vent, a horizontal/vertical-vent, a dual direct vent, a multisided unit, or other gas fireplace or insert. The present invention may also be applicable to other fuel burning systems other than a fireplace, as noted above.

As used herein, the term "coupled" means any structure or method that may be used to provide connectivity between two or more elements, which may or may not include a direct physical connection between the elements. The term "flue" is used herein to mean an exhaust duct system that includes an exhaust duct. This system may include, however, an intake air duct coaxial to or co-lineal with the exhaust duct.

Referring now to Figure 1, a side view of an example embodiment of a fireplace 100 is shown. The fireplace 100 includes a combustion chamber enclosure 110. The fireplace 100 generally functions to ignite combustible gas using a gas burner unit 120. Two flue ducts 130, 140 in a co-lineal arrangement are attached to the fireplace 100. The fireplace 100 has vents for venting exhaust gases that are produced during combustion and bringing in fresh air to the combustion chamber enclosure 110. The vent includes vent openings in the fireplace 100, identified as outlet area 135 and inlet area 145 of the fireplace 100. Duct 130 serves to vent exhaust gases or combustion products from the fireplace 100. Duct 140 brings in fresh air to the fireplace 100. These flue ducts 130, 140 are coupled to the fireplace to match up with outlet area 135 and inlet area 145 of the fireplace 100 via a flue connection member 150.

The fireplace 100 shown in Figure 1 shows a slant back type fireplace insert and flue ducts 130, 140 extend at an angle. Slant back type fireplaces can be especially difficult to attach flue ducts to in the conventional manner because the slanted back portion of the fireplace can be difficult to reach during installation. However, the arrangement, shape, and configuration of the flue ducts or appliance can vary without affecting the application of the present invention. For example, the flue ducts could extend vertically or horizontally. Additionally, the flue ducts could extend vertically and then extend horizontally. Also, the flue ducts can be designed in any number of shapes. They could be cylindrical, rectangular, or any other desired shape, size, or diameter of duct. The appliance itself can also be shaped in any manner and still benefit from the present invention.

Referring to Figure 2, a schematic perspective view of the flue connection member 150 is shown. Flue connection member 150 includes a flue plate 155. Although the flue connection member 150 includes a plate portion as shown in Figure 2, the flue connection member 150 can be formed in any suitable shape without  
5 departing from the scope of the present invention.

As shown in Figure 2, the flue plate 155 is connected to two cylindrical extensions 160, 170. These extensions 160, 170 are slightly smaller in diameter than ducts 130, 140 (shown in Figure 1). However, it is not necessary that the ducts be smaller in diameter. For example, the ducts could be constructed of a material capable  
10 of expanding and being pulled over the flue plate's cylindrical extensions. Alternatively, the diameter of the ducts could be slightly smaller than the cylindrical extensions and some other means of attachment of the ducts to the cylindrical extensions could be utilized.

The extensions 160, 170 also define openings or apertures in the flue plate 155.  
15 As discussed in more detail below, these openings create the necessary pathway in the flue connection member 150 to allow the exhaust or intake air to pass from the fireplace 100 to the flue ducts 130, 140.

The flue plate 155 may also have notches (or slits) 175 for aligning and connecting the flue plate 155 to the fireplace 100. The fireplace 100 can be preformed  
20 with matching extensions or tabs that would engage notches 175 and aid as guiding members, as well as provide a means of attachment, when coupling the flue plate 155 to the fireplace 100. The notches 175 shown in Figure 2, are rectangular, however, they may be constructed in any shape that would match corresponding extensions or tabs on a fireplace or fireplace plate, as discussed in more detail below.

25 The flue plate 155 has a top surface and a bottom surface. The top surface of the flue plate 155 faces flue ducts 130, 140. The bottom surface faces the fireplace 100. As shown in Figure 3, lower extending portions 162, 172 preferably extend outward from the bottom surface of the flue plate 155. Lower extending portions 162, 172 can simply be an extension of the cylindrical extensions 160, 170 or they can be attached to the flue  
30 plate 155 separately. The lower extending portions 162, 172 provide additional guides

for positioning and attaching the flue plate 155 to the fireplace 100. In particular, the fireplace 100 can be designed with a seat, described in more detail below, in which the lower extending portions 162, 172 rest.

Referring now to Figure 4, the flue connection member 150 is preferably  
5 coupled to the ducts 130, 140 by sliding the ducts 130, 140 over the cylindrical extensions 160, 170 and coupling the ducts 130, 140 to the cylindrical extensions 160, 170 by mechanical attachment, such as a collar with a screw-tightening member. Other mechanical attachment means include adhesion, screws, pivotal flanges, nuts and bolts, and springs.

10 After the flue connection member 150 is coupled to the ducts 130, 140, the flue connection member 150 can then be coupled to the fireplace 100. By this arrangement, the flue connection member 150 can be secured to flue ducts 130, 140 before the fireplace 100 is placed into a fireplace insert area. This simplifies connection of the flue ducts 130, 140 to the fireplace 100. Instead of having to attach both flue ducts 130,  
15 140 to the fireplace while the fireplace is in the fireplace insert area, the person installing the fireplace need only attach the flue connection member 150 to the fireplace 100.

The use of guiding members can simplify this task even further. For example, by providing the flue plate 155 with lower extending portions 162, 172 and by  
20 designing the fireplace 100 with a seat that matches up with those portions, the flue plate 155 can be easily guided into position. Alternatively, or in addition, the notches 175 and matching tabs in the fireplace 100 can also assist this task. Once the flue plate 155 is in position on the fireplace 100, the flue plate 155 can be coupled to the fireplace 100 by any number of mechanical means. For example, the flue plate 155 can be  
25 screwed or bolted into place. Alternatively, a variety of latching mechanisms can be used (as described in more detail in later).

The above embodiment is intended to be used with a fireplace or other appliance, that has a preformed means for coupling the flue plate to the fireplace or other appliance. It is also envisioned that a fireplace or other appliance could be very  
30 simply modified to receive a flue plate such as that described in the embodiment above.

For example, holes could be drilled into a fireplace unit or other appliance to receive screws or bolts which provide the necessary attachment means for coupling the flue plate to the fireplace or other appliance.

5 In another embodiment, a flue connection member 250 can be used with a fireplace connection member (appliance connection member) 220 that is attached to a fireplace. Fireplace connection member 220 and a flue connection member 250 of this embodiment are shown in Figure 5. Although fireplace connection member 220 is shown in use with a fireplace, connection member 220 can be used or modified to be used with any other appliance.

10 Flue connection member 250 includes a flue plate 255 and fireplace connection member 220 includes a fireplace plate 225. Although the flue connection member 250 and the fireplace connection member 220 preferably include plate portions 255, 225 as shown in Figure 2, alternatively, the flue connection member and fireplace connection member can be formed in any suitable shape without departing from the scope of the  
15 present invention.

As described in the previous embodiment, the flue connection member 250 is coupled to ducts (an outlet duct, or an inlet and outlet duct). In this embodiment fireplace plate 225 is coupled to a fireplace. The flue plate 255 is then seated on top of the fireplace plate 225 and coupled to the fireplace via the fireplace plate 225.

20 The flue plate 255 shown in Figure 5 is the same as that described in the first embodiment. For example, it has two cylindrical extensions 260, 270, and these extensions 260, 270 are slightly smaller in diameter than the ducts 130, 140. The extensions 260, 270 also define openings or apertures in the flue plate 255. These openings create the necessary pathway in the flue connection member 250 to allow the  
25 exhaust or intake air to pass from the fireplace to the flue ducts 130, 140.

The flue connection member 250 is preferably coupled to ducts by sliding the ducts over the cylindrical extensions 260, 270 and coupling the ducts to the cylindrical extensions 260, 270 by mechanical attachment, such as a collar with a screw-tightening member. The flue plate 255 may also have notches (or slits) 275 for aligning and  
30 connecting the flue plate 255 to the fireplace 100.



The flue plate 255 has a top surface and a bottom surface. The top surface of the flue plate 255 faces flue ducts 130, 140. The bottom surface faces the fireplace 100. As shown in Figure 6, lower extending portions 262, 272 preferably extend outward from the bottom surface of the flue plate 255. Lower extending portions 262, 272 can be an extension of the cylindrical extensions 260, 270 or they can be attached to the flue plate 255 separately. The lower extending portions 262, 272 provide additional guides for positioning and attaching the flue plate 255 to the fireplace plate 225. In particular, the fireplace plate 225 is designed with a seat, described in more detail below, in which the lower extending portions 262, 272 rest. These features are the same as those described above with respect to the first embodiment.

Referring again to Figure 5, the fireplace connection member 220 will now be described in more detail. The fireplace connection member 220 is designed to be coupled to a fireplace. This can be accomplished by any number of different methods. For example, the fireplace plate 225 can be bolted or screwed onto the fireplace. Holes 288 in the fireplace plate 225 may provide the necessary opening for bolting or screwing the fireplace plate 225 onto an exterior surface of a fireplace. The exterior surface that the fireplace plate 225 is to be coupled to could be any side or top surface of the fireplace.

The fireplace plate 225 has two openings 235, 245. These openings 235, 245 match up with an outlet area and an inlet area of the fireplace (such as those shown in Figure 1). The fireplace plate 225 also includes seats 275, 285, which surround the openings 235, 245. These seats 275, 285 match up with the area of the lower extending portions 262, 272 shown in Figure 6. Additionally, the fireplace plate 225 has several tabs (or extensions) 290. Tabs 290 match up with the notches 275 in the flue plate 255. As shown in Figure 5, the tabs 290 do not have to be of the same size. Rather it is only necessary that the tabs 290 be proportioned to match appropriately with their respective holes 275.

When attaching the flue plate 255 to the fireplace plate 225, the flue plate 255 can be easily guided into the proper position by using the tabs 290 and notches 275, and by using the seats 275, 285 and the lower extending portions 262, 272.

The fireplace plate 225 also has two latches 291 that pivot about a pivot member 292. The latches have a slot 293, and within the slot 293 is a bolt 294. The pivot member 292, slot 293, and bolt 294 define a curved path of travel for the latches 291.

Figures 7 and 8 show fireplace connection member 220 and flue connection member 250 coupled together. In Figure 8, the latches 291 are shown in an engaged or locked position, which secures the fireplace connection member 220 to the flue connection member 250. Figures 9 and 10 are similar to Figures 7 and 8, except that the fireplace connection member 220 is also attached to fireplace 200.

As shown in Figures 7-10 (for clarity, the flue connection member 250 is shown in these figures without any ducts attached), the fireplace connection member 220 is attached to a fireplace 200. The flue plate 250 is seated on the fireplace connection member 220, and then latches 291 can be rotated so that the flue connection member 250 is secured to the fireplace connection member 220. Figures 8 and 10 depict a fireplace connection member 220 where the latches 291 have been fully rotated. Once the latches 291 are rotated, if desired or required by local building code the latches 291 can be further secured by attaching a screw or bolt through opening 295 (shown in Figure 5) and a matching opening in the fireplace plate (not shown).

It is also intended that the present invention could be used in a gas fireplace with co-axial ducts (or pipes). In particular, some fireplaces are vented by a concentric duct arrangement in which flue gases are exhausted through a central duct while intake air is drawn into the combustion chamber through an annular space defined by an outer larger diameter duct. Such fireplace construction has become popular because the cooling effect on the central exhaust duct by the intake air allows the fireplace to be vented without costly masonry chimney construction.

In another embodiment of the present invention, a system for attaching the flue ducts in a co-axial fireplace assembly is shown.

Referring now to Figure 11, a side view of an example embodiment of a coaxial duct fireplace 300 is shown. Fireplace 300 includes a combustion chamber enclosure 310. Fireplace 300 generally functions to ignite combustible gas using a gas burner unit 320. Two co-axial flue ducts 330, 340 are attached to Fireplace 300. Duct 330 serves

to vent exhaust gases or combustion products from the fireplace 300. Duct 340 brings in fresh air to the fireplace 300. Ducts 330, 340 are coupled to the fireplace to match up with outlet area 335 and inlet area 345 of fireplace 300.

As shown in Figure 12, flue connection member 350 includes flue plate 355 and two cylindrical extensions 360, 370. Cylindrical extensions 360, 370 are co-axial (concentric) in order to match up with co-axial flue ducts 330, 340. Flue plate 355 is preferably coupled to ducts 330, 340 by sliding ducts 330, 340 over cylindrical extensions 360, 370 and coupling ducts 330, 340 to cylindrical extensions 360, 370 by mechanical attachment, such as a collar with a screw-tightening member. Because of the arrangement of co-axial ducts 330, 340, there need only be one collar attached to the outside of the outer flue duct 340, which overlaps outside cylindrical extension 370.

Fireplace connection member 420 is similar in structure to that of the fireplace plate of the second embodiment. However, certain differences are necessary because of the co-axial nature of the ducts 330, 340. For example, there is a single opening or aperture 470 in the fireplace plate 425, and there is a single seat 485 that surrounds the opening 470.

The rest of the elements shown in Figure 12 are the same as those shown in Figure 5. The fireplace plate 425 also has two latches 491 that pivot about a pivot member 492. The latches have a slot 493, and within the slot 493 is a bolt 494. The pivot member 492, slot 493, and bolt 494 define a curved path of travel for the latches 491. The fireplace plate 425 has several tabs (or extensions) 490. Tabs 490 match up with the notches 375 in the flue plate 355. If desired or required by local building code the latches 491 can be further secured by attaching a screw or bolt through opening 495. The functions of these elements are the same as that described above with respect to previous embodiments.

Figures 13 and 14 show a side and plan schematic view of flue plate 355. The flue plate 355 has a top surface and a bottom surface. The top surface of the flue plate 355 faces coaxial flue ducts. The bottom surface faces a fireplace. As shown in Figure 13, lower extending portions 362, 372 preferably extend outward from the bottom surface of the flue plate 355. Lower extending portions 362, 372 can simply be

extensions of the cylindrical extensions 360, 370 or they can be attached to the flue plate 355 separately. The lower extending portions 362, 372 provide additional guides for positioning and attaching the flue plate 355 to the fireplace plate 325. In particular, the fireplace plate 325 is designed with a seat in which the lower extending portions  
5 362, 372 rest. These features are similar to those described above with respect to the previous embodiment.

As shown in Figure 14, the inner cylindrical extension 360 is connected to the outer cylindrical extension 370 by arms 374. Although four arms are shown in Figure 14, more or less arms could be used to connect the cylindrical extensions. In addition,  
10 other means to secure these two elements together could be used other than arms.

The remaining elements and the method of operation of the flue connection system of the third embodiment are the same as that described above with respect to the second embodiment.

In yet another embodiment of the present invention, a system for attaching a  
15 single flue duct to an appliance is shown. In some circumstances it may be desired to couple only a single duct, for example, a single exhaust or inlet duct, to an appliance.

This embodiment is similar to the other embodiments described above, but has only a single duct and single extending member of the flue connection member.

Referring to Figure 15, a schematic perspective view of the flue connection  
20 member 550 is shown. Flue connection member 550 includes a flue plate 555. Although the flue connection member 550 includes a plate portion as shown in Figure 15, the flue connection member 550 can be formed in any suitable shape without departing from the scope of the present invention.

As shown in Figure 15, the flue plate 555 is connected to one cylindrical  
25 extension 560. This extension 560 is slightly smaller in diameter than duct 530 (shown in Figure 17). However, it is not necessary that the ducts be smaller in diameter. For example, the ducts could be constructed of a material capable of expanding and being pulled over the flue plate's cylindrical extensions. Alternatively, the diameter of the ducts could be slightly smaller than the cylindrical extensions and some other means of  
30 attachment of the ducts to the cylindrical extensions could be utilized.

The extension 560 also defines an opening or aperture in the flue plate 555. As discussed in more detail below, these openings create the necessary pathway in the flue connection member 550 to allow the exhaust or intake air to pass from an appliance, such as a fireplace, to the flue ducts 530.

5        The flue plate 555 may also have notches (or slits) 575 for aligning and connecting the flue plate 555 to the fireplace or other appliance. The fireplace or other appliance can be preformed with matching extensions or tabs that would engage notches 575 and aid as guiding members, as well as provide a means of attachment, when  
10        coupling the flue plate 555 to the appliance. The notches 575 shown in Figure 15, are rectangular, however, they may be constructed in any shape that would match corresponding extensions or tabs on the appliance.

      The flue plate 555 has a top surface and a bottom surface. The top surface of the flue plate 555 faces flue duct 530. The bottom surface faces the appliance. As shown in Figure 16, lower extending portion 562 preferably extend outward from the bottom  
15        surface of the flue plate 555. Lower extending portion 562 can be an extension of the cylindrical extensions 560 or it can be attached to the flue plate 555 separately. The lower extending portion 562 provides additional guides for positioning and attaching the flue plate 555 to the fireplace or other appliance. In particular, the fireplace or other appliance can be designed with a seat, described in more detail above, in which the  
20        lower extending portion 562 rests.

      Referring now to Figure 17, the flue connection member 550 is preferably coupled to the duct 530 by sliding the duct 530 over the cylindrical extension 560 and coupling the duct 530 to the cylindrical extension 560 by mechanical attachment, such as a collar with a screw-tightening member. Other mechanical attachment means  
25        include adhesion, screws, pivotal flanges, nuts and bolts, and springs.

      After the flue connection member 550 is coupled to the duct 530, the flue connection member 550 can then be coupled to the fireplace or other appliance as described above in the other embodiments. For example, the flue connection member 550 can be attached directly to the fireplace or other appliance, or it can be attached to

an appliance or fireplace connection member which is attached to the appliance or fireplace directly.

5 The remaining elements and the method of operation of the flue connection system of the fourth embodiment are the same as that described above with respect to the previous embodiments.

10 The present invention should not be considered limited to the particular examples or materials described above, but rather should be understood to cover all aspect of the invention as fairly set out in the attached claims. Various modifications, equivalent processes, as well as numerous structures to which the present invention may be applicable will be readily apparent to those of skill in the art to which the present invention is directed upon review of the instant specification.